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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/654,765
Filing Date: September 04, 2003
Appellant(s): NORDMAN, PAUL S.

Mark Elchuk
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 31 July 2009 appealing from the Office action mailed 03 March 2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,665,450	DAY	9-1997
5,885,714	DEMEESTER	3-1999
4,793,108	BAIN	12-1988
3,081,205	SHORR	3-1963
5,500,272	PADDEN	3-1996
3,534,004	LUVISI	10-1970
3,074,832	GRAFF	1-1963

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 3, 4, 7, and 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over DAY in view of the collective teachings of DEMEESTER, BAIN, SHORR, and PADDEN, and further in view of LUVISI.

DAY teaches a method of forming a structural window panel for an aircraft comprising the steps of providing a plurality of layers of generally optically transparent fiber impregnated resin tape (prepreg) wherein the index of refraction of the fibers matches that of the resin, heating the prepreg layers within a tool to cause the resin to

flow and cure, thereby producing a structural window panel (Abstract; column 1, lines 52-56; column 2, lines 5-13; column 3, lines 39-65; column 7, lines 13-42; column 9, lines 24-44; column 10, lines 63-65; column 11, lines 24-29 and lines 47-67; column 12, lines 1-12; column 13, lines 13-17; column 15, lines 17-18).

DAY differs from the claims in that there is no teaching of interleaving the prepreg between a plurality of metal sheets which form a frame structure wherein the metal sheets define an opening. However, it is generally well known in the art of aircraft window manufacture to provide an embedded reinforcing material around the periphery of a window to provide improved strength and rigidity. For example, DEMEESTER provides a steel, aluminum, or metal alloy reinforcing member 5 embedded around the periphery of an aircraft window for improved rigidity around the periphery (Abstract; column 1, lines 54-56; column 2, lines 1-20). BAIN teaches an embedded reinforcing member around the periphery of an aircraft window for transmitting load around the window edge and providing increased strength in the peripheral critical shear-bearing area of the window pane (column 1, lines 25-50). While DEMEESTER and BAIN are directed to singular reinforcing members, it is also known to provide a plurality of metal reinforcing sheets around the periphery of an aircraft window. For example, SHORR provides aluminum, titanium, steel, or composite reinforcing frames 7 and 8 embedded in the periphery (column 3, lines 5-14; column 4, lines 39-61). It is also noted that SHORR provides mounting holes through the metal reinforcing frames (column 5, lines 43-46). It is generally known in the art of manufacturing composite structures from prepreg layers that multiple thin metal sheets can be provided between the prepreg

layers in areas which receive fasteners through mounting holes in order to provide sufficient reinforcement in the fastener area, allow fewer prepreg layers, and thereby save cost and weight, as evidenced by PADDEN (Abstract; Figures 1-5B; column 1, lines 5-13 and lines 35-49; column 3, lines 14-17). PADDEN is also directed to aircraft applications (column 1, lines 12-13). As to interleaving prior to heating, PADDEN suggests interleaving prior to flowing of the matrix resin to achieve strong bonding and interlocking between the resin and metal reinforcing sheets (column 1, lines 35-58; column 2, lines 29-67). SHORR also suggests interleaving (column 8, lines 65-75; column 9, lines 1-20). Collectively, DEMEESTER, BAIN, SHORR, and PADDEN clearly suggest embedding one or more metal reinforcing sheets around the periphery of an aircraft window by interleaving the metal sheets with the prepreg layers of DAY prior to heating to flow and cure the resin. Only the expected result of reinforcing the periphery of the window has been achieved. It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the claimed interleaving limitation to result in the claimed panel having a see-through window portion in the frame structure because one of ordinary skill in the art would have been motivated to provide the window of DAY with peripheral reinforcement in view of the collective teachings of DEMEESTER, BAIN, SHORR, and PADDEN.

Alternatively, it is also noted that the claims do not appear to distinguish over a single metallic frame structure which is provided by, for example, a strip of metal for each side of the frame. Such is clearly suggested by SHORR (column 7, lines 31-49). While SHORR does not explain why one might use metal strips to form the frame, one

of ordinary skill in the art would have readily appreciated that a large amount of waste would be produced by providing a large metallic sheet and cutting out the opening for the window. It would have been readily apparent to one of ordinary skill in the art that waste is substantially reduced by making the frame from strips.

As to the claimed aliphatic epoxy resin, such materials are known to be suitable for aircraft window applications. LUVISI explains that such materials are flame resistant, are colorless, have high color stability, and are useful in aircraft canopies and windows (column 1, lines 54-62; column 3, lines 2-3 and lines 13-52; column 5, lines 27-29). Additionally, DAY indicates that practically all transparent polymers are suitable (column 7, line 1). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the claimed aliphatic epoxy resin as the matrix material because one of ordinary skill in the art would have been motivated to use any known suitable polymer for aircraft window applications in accordance with the teachings of DAY and LUVISI. As to the property of being resistant to shrinkage, as previously argued by Appellant, such is inherent in the use of aliphatic epoxies.

As to the language requiring a continuous peripheral edge, this limitation is suggested by the applied prior art. DEMEESTER suggests a continuous peripheral edge for the reinforcement 5 (Figure 1). SHORR specifically indicates that the peripheral reinforcement may be provided as a continuous frame or as a plurality of strips (column 7, lines 31-49; Figure 1). It is further noted that a plurality of strips may be used to provide a continuous peripheral edge. The recitation of a continuous edge simply requires an edge which is unbroken. It would have been obvious to one of

ordinary skill in the art at the time of the invention to provide the claimed continuous peripheral edge because one of ordinary skill in the art would have been motivated to provide suitably shaped reinforcing members in accordance with the teachings of DEMEESTER and SHORR.

The limitations of claims 3 and 4 are clearly suggested by DAY (column 7, lines 13-42; column 11, lines 48-67; column 12, lines 1-12).

The limitations of claims 7 and 9-11 have been satisfied for the reasons set forth above.

Regarding claim 12, the use of prepreg tape having a width within the claimed range is well known in the art of composite manufacture. For example, such widths are known to be suitable for use with automated layup devices to achieve high speed and accurate layup of the prepreg material. Additionally prepreg tape having a width of less than 12 inches would naturally be used for windows having dimensions than 12 inches to avoid trimming large amounts of prepreg and thereby producing excessive waste. Selection of prepreg having a suitable width involves no more than expected and routine design choice for any of these reasons.

Claims 13, 15, 17, 20-22, 25, and 29-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over DAY in view of the collective teachings of DEMEESTER, BAIN, SHORR, and PADDEN, and further in view of LUVISI as applied to claims 1, 3, 4, 7, and 9-12 above, and further in view of GRAFF.

Claim 13 requires a metal sheet having a plurality of openings and covering the metal sheet with prepreg to form a plurality of window portions which are spaced apart. Thus claim 13 differs from the modified method of DAY in that the peripheral reinforcing sheet also includes a portion which extends through the middle of the window to form multiple window portions. Such is generally known in the window art, as evidenced by GRAFF (Figures 3 and 3a). GRAFF is directed to improving the rigidity and strength of fiber reinforced resin window laminates for a variety of applications (column 1). For example, GRAFF explains that for some applications it is disadvantageous for these transparent materials to have low rigidity (column 1, lines 27-29). GRAFF suggest the use of a metal frame for reinforcing transparent epoxy resin/glass fiber composites (column 1, lines 70-72; column 2, lines 1-15). It would have been obvious to one of ordinary skill in the art at the time of the invention to provide the reinforcing frame in the modified method of DAY with a central member to provide the claimed plurality of openings because one of ordinary skill in the art would have been motivated to further reinforce the window in accordance with known methods as evidenced by GRAFF.

The limitations of claims 15, 17, 20-22, 25 and 29 are rejected for the reasons set forth above.

The limitations of claims 30-33 are considered conventional in the art of lamination of prepreg materials for providing suitable heat and pressure to form a laminated product. Additionally, DAY suggests a caul plate (column 16, lines 38-52), pressures within the claimed range, and application of vacuum (column 11, lines 5-17). Further, determination of appropriate temperatures and pressures for curing the resin to

achieve adequate curing and consolidation involves no more than expected and routine experimentation in view of the pressure range suggested by DAY. Different resins require different curing temperatures, as is well known in the art.

(10) Response to Argument

Appellant argues that DAY is completely silent on manufacturing the window with one or more metallic, peripheral layers to provide additional strength to the peripheral edge of the window. However, DAY was not relied upon for the limitation of the peripheral metallic reinforcing layers. DEMEESTER, BAIN and SHORR were collectively relied upon to show that it is generally well known in the art of aircraft window manufacture to provide an embedded reinforcing material around the periphery of window to provide improved strength and rigidity. It is also clear from these references that the peripheral reinforcing layers may be metallic.

Appellant argues that none of the references suggest the combination of limitations comprising interleaving one or more metal peripheral layers that have an opening between layers of a transparent window structure made up of transparent fibers and a transparent resin that has an index of refraction that matches the index of refraction of the transparent fibers. While the examiner acknowledges that none of the cited references teach all of these limitations, it is the examiner's position that the applied references, taken together, do suggest this combination of limitations. In particular, DAY was applied for teaching the transparent window structure made up of transparent fibers and a transparent resin that has an index of refraction that matches

the index of refraction of the transparent fibers. DEMEESTER, BAIN and SHORR were relied upon to show that integral metal reinforcing layers having an opening are generally known in the art of transparent window manufacture for the purpose of reinforcing the peripheral edge of the window. PADDEN was relied upon to show that one of ordinary skill in the art would have appreciated particular benefits in providing such integral metallic reinforcing layers by interleaving the metal peripheral layers with the layers of optically transparent fibers impregnated resin tape in DAY. For example, PADDEN teaches achieving strong bonding and interlocking between the resin and metal reinforcing sheets by interleaving.

Appellant argues that it is unobvious to use one or more metallic interlayers with the composite transparent window structure of DAY because the composite panel of DAY already has improved strength by itself. This argument is not persuasive because PADDEN is also directed to composite materials having high strength, and teaches that interleaving metallic reinforcement with the fiber reinforced prepregs is desirable for providing additional strength. The examiner acknowledges that DAY does not mention such peripheral reinforcement. However, the examiner's position is that one of ordinary skill in the art would still appreciate that DAY's window would benefit from such reinforcement in accordance with the teachings of the applied secondary references to DEMEESTER, BAIN, SHORR and PADDEN.

Appellant argues there is nothing in PADDEN which would suggest the desirability of combining its teachings with DAY. Appellant also points to the fact that PADDEN does not provide a window portion, but rather uses a full layer of titanium and

makes no mention of forming the metallic interlayer as a peripheral member. As to PADDEN's failure to teach a window portion or a peripheral metallic interlayer, this argument is not persuasive because each of DEMEESTER, BAIN and SHORR suggests the use of a peripheral integral member for reinforcing aircraft windows. Furthermore, one of ordinary skill in the art would have readily appreciated that the use of a full layer of metallic interlayer would render the window non-transparent. As to the argument that PADDEN does not suggest the desirability of combining its teachings with DAY, as noted above, PADDEN teaches achieving strong bonding and interlocking between the resin and metal reinforcing sheets by interleaving. PADDEN also teaches that the metallic interlayers are useful for reinforcing areas which receive fasteners through mounting holes, allowing fewer prepared layers, and thereby saving costs and weight. As shown by SHORR, it is known to provide mounting holes through the integral peripheral metal reinforcing frames (column 5, lines 43-46). Thus it is also clear from PADDEN and SHORR that such peripheral metallic interlayers may provide particular reinforcing advantages and weight savings where peripheral mounting holes are provided.

Appellant argues that the examiner has given no weight to the fact that one of ordinary skill in the art would not appreciate a need to reinforce a composite window panel with a peripheral reinforcing structure. This examiner has already responded to this argument above with respect to the argument that the composite panel of DAY is already strong in itself.

Appellant argues that the examiner has not cited any art involving composite windows with a interleaved metallic peripheral edge reinforcing structure provided during the manufacture of the window assembly. This examiner has already responded to this argument above in noting that the rejection is based on the combined teachings of a plurality of references and specifically pointing out how the references have been relied upon to satisfy this combination of limitations.

Appellant argues that DEMEESTER is not directed to the manufacture of a composite window, and due to the significant increased strength of a composite material panel there is nothing in DEMEESTER to suggest combining its teachings with a transparent composite window panel. This argument is not persuasive for the reasons provided above with respect to Appellant's argument that the composite panel of DAY is already strong in itself.

Appellant argues that the peripheral reinforcement used by BAIN is not described as being a metal component. In response, DEMEESTER and SHORR clearly suggest the use of metallic peripheral reinforcing interlayers, as set forth in the rejection above. BAIN was relied upon to provide additional evidence for the examiner's assertion that it is generally well known in the art of aircraft window manufacture to provide an embedded reinforcing material around the periphery of a window to provide improved strength and rigidity. Appellant argues there is nothing in BAIN to suggest interleaving a metal peripheral panel with one or more composite, transparent layers and heating the assembly in a tool to produce a unitary window structure. However, the primary reference to DAY suggests the use of composite transparent layers and heating the

assembly in a tool to produce a window structure, as set forth in the rejections above. PADDEN was relied upon to show that interleaving prior to flowing of the matrix resin is advantageous for achieving strong bonding and interlocking between the resin of the composite layers and the metal reinforcing sheets. One of ordinary skill in the art would have readily appreciated that the flowing of resin noted by PADDEN occurs within the tool of DAY. For example, DAY provides heat and pressure at a temperature above the glass transition temperature or softening point of the transparent resin polymer (column 10, lines 63-65), and clearly indicates that the polymer flows during heated compression (column 10, lines 52-56). Thus it is clear that one of ordinary skill in the art would have provided the interleaved composite layers and metal reinforcing sheets into the tool taught by DAY in order to achieve the above noted advantages of strong bonding and interlocking in accordance with the teachings of PADDEN.

Appellant argues there is nothing in BAIN to suggest combining it with the teachings of DAY, PADDEN or DEMEESTER. In response, the primary reference is to DAY. As noted above, BAIN was relied upon to provide evidence for the examiner's assertion that it is generally well known to provide an embedded reinforcing material in a window to provide improved strength and rigidity. Accordingly, the examiner respectfully disagrees with the argument that there is nothing in BAIN to suggest improving upon the primary reference to DAY.

Appellant argues that SHORR does not suggest the limitation of extending the window material to the outer peripheral edges of the metal sheets, as claimed. In response, DEMEESTER and BAIN clearly suggest extending the transparent window

material to the peripheral edges of the metal sheets to provide a suitably reinforced window structure. The particular relationship between the transparent window material and the peripheral metallic reinforcing interlayer depends upon the desired arrangement for mounting the window to a structure. DEMEESTER and BAIN show that the claimed arrangement is known and desirable for particular mounting structures.

Appellant argues that there is no suggestion of using the teachings of SHORR with those of DAY. The examiner respectfully disagrees. SHORR clearly provides evidence for the examiner's assertion that it is generally well known in the art of aircraft window manufacture to provide an embedded reinforcing material around the periphery of the window to provide improved strength and rigidity.

Appellant argues LUVISI does not suggest the claimed epoxide for use in a method of forming a structural panel having a peripheral reinforcing metallic interlayer and where the window has a construction of fibers and resin having matching indices of refraction. In response, the primary reference to DAY is directed to forming a window from transparent fiber impregnated resin tape wherein the index of refraction of the fibers matches that of the resin. DAY further indicates that practically all transparent polymers are suitable (column 7, line 1). Furthermore, LUVISI indicates that the claimed epoxy resin is particularly suitable in aircraft windows and explains that such materials have particular advantages such as flame resistance, transparency and high color stability. Accordingly, the examiner finds a strong suggestion to use the epoxy of LUVISI in the modified method of DAY.

Appellant argues that GRAFF does not disclose anything that would suggest combining its teachings with those of the other cited references. The examiner respectfully disagrees. As noted in the rejection above, GRAFF is directed to improving the rigidity and strength of fiber reinforced window laminates for a variety of applications and suggests the use of a metal frame for reinforcing transparent epoxy resin/glass fiber composites. The metal frame suggested by GRAFF also clearly satisfies the claimed plurality of spaced apart openings in claim 13. Thus GRAFF provides motivation for using such a frame in the fiber reinforced composite panel of DAY in order to provide additional rigidity and strength.

Appellant argues that the examiner has used improper hindsight reasoning in combining references to arrive at the claimed invention. In response, the examiner has provided specific motivation provided in the teachings of each applied reference to arrive at the claimed invention. The examiner has not merely picked and chosen isolated teachings from various references, as argued by Appellant, but rather has used DEMEESTER, BAIN, SHORR and PADDEN to show that one of ordinary skill in the art would have been motivated to provide reinforcement to the composite window of DAY in the claimed manner. The repeated arguments against DAY, PADDEN, DEMEESTER, BAIN and LUVISI are not persuasive for the reasons provided above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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